National Institute of Environmental Health Sciences

Pathogen-host associations and predicted range shifts of human monkeypox in response to climate change in Central Africa

Author(s): Thomassen HA, Fuller T, Asefi-Najafabady S, Shiplacoff JAG, Mulembakani PM, Blumberg S, Johnston SC, Kisalu NK, Kinkela TL, Fair JN, Wolfe ND, Shongo RL, LeBreton M, Meyer H, Wright LL, Muyembe JJ, Buermann W, Okitolonda E, Hensley LE, Lloyd-Smith JO, Smith TB, Rimoin AW

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Abstract:

Climate change is predicted to result in changes in the geographic ranges and local prevalence of infectious diseases, either through direct effects on the pathogen, or indirectly through range shifts in vector and reservoir species. To better understand the occurrence of monkeypox virus (MPXV), an emerging Orthopoxvirus in humans, under contemporary and future climate conditions, we used ecological niche modeling techniques in conjunction with climate and remote-sensing variables. We first created spatially explicit probability distributions of its candidate reservoir species in Africa's Congo Basin. Reservoir species distributions were subsequently used to model current and projected future distributions of human monkeypox (MPX). Results indicate that forest clearing and climate are significant driving factors of the transmission of MPX from wildlife to humans under current climate conditions. Models under contemporary climate conditions performed well, as indicated by high values for the area under the receiver operator curve (AUC), and tests on spatially randomly and non-randomly omitted test data. Future projections were made on IPCC 4th Assessment climate change scenarios for 2050 and 2080, ranging from more conservative to more aggressive, and representing the potential variation within which range shifts can be expected to occur. Future projections showed range shifts into regions where MPX has not been recorded previously. Increased suitability for MPX was predicted in eastern Democratic Republic of Congo. Models developed here are useful for identifying areas where environmental conditions may become more suitable for human MPX; targeting candidate reservoir species for future screening efforts; and prioritizing regions for future MPX surveillance efforts.

Source: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3729955

Resource Description

Communication: ☑

resource focus on research or methods on how to communicate or frame issues on climate change; surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Communication Audience: ☑

audience to whom the resource is directed

Policymaker

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes

Geographic Feature:

resource focuses on specific type of geography

Tropical

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Africa

African Region/Country: African Region

Other African Region: Central Africa

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Zoonotic Disease

Zoonotic Disease: Other Zoonotic Disease

Zoonotic Disease (other): Monkeypox

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Mitigation

Model/Methodology:

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Population of Concern: A focus of content

Population of Concern:

populations at particular risk or vulnerability to climate change impacts

Low Socioeconomic Status

Other Vulnerable Population: Populations with a high disease burden

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content